Economic Crisis Implications on Labour Market for EU Countries

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Abstract

The current global economic crisis is a reminder of the inherent vulnerabilities faced by European Union economies on their road to economic growth and sustainable development. The crisis has negatively affected economic growth in every European Union country but the countries from Central and Eastern Europe felt strongly the effects of this crisis. In the paper, we propose the analysis of the economic crisis effects launched globally in 2008 over labor market in the EU countries. The indicators used in the empirical study are real GDP per capita, unemployment rate and median income.

Keywords: economic crisis, economic growth, labour market

I - Introduction

In this paper we choose to work on the data for the European Union countries on a specific time frame. We focused on the 2007 economic crisis, considered by many economists as the worst financial crisis since the Great Depression of the 1930s. This big event in the economic history attracted our attention and we chose to analyze it in order to better understand its causes and mostly its consequences in global terms. This is why we thought of choosing the European Union countries and analyzing the different economic evolution.

The objectives followed in this paper are analyzing the differences between EU countries taking into account the most important macroeconomic indicators in the EU countries during the period 2005-2016. Those are: real GDP/capita (%), unemployment rate (%), median income (%). Further we continue our study with the estimation of the differences of economic growth in the year of the beginning of the economic crisis (2009) compared with the most recent year with available data on different groups of countries. For reaching these objectives we structured the paper as follows: in the first part we studied the theoretic effects of the economic crisis over the labour market which are presented in Literature review, after this we explained the methods that will be used, which can be found in Data & Research methodology part, followed by the Empirical study which is the interpretation of data and ending with conclusions.

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II - Literature review

In 2007, the rapid employment growth that preceded the crisis began to slow, and by 2008 all regions of the world of work had experienced a deceleration of employment growth. In the EU countries, year-on-year employment growth fell from around 1.9 % at the beginning of 2008 and -1.2 % for the second quarter of 2009. And although negative growth rates have started to decline, until the beginning of 2010 growth rates had not yet turned positive. Generally, inflow and outflow rates, to and from unemployment, tend to be cyclical, i.e. following upward and downward economic trends. More precisely, during economic recessions the inflow rate increases as people become unemployed and the outflow rate decreases as the slowdown in the economy makes it harder for unemployed workers to find jobs. Available data for a small group of advanced EU economies regarding inflow/outflow rates provide key information about the dynamics of the labour market, especially with regard to potential weaknesses and strengths near turning points. Although this cyclicality holds true for all countries and periods analyzed, the relationship between unemployment inflows and outflows differs across countries and has varied over time. During previous recessions increases in the inflow rate and decreases in the outflow rate were less severe; but during this recent crisis many countries have attained historical highs and lows. In the current context, there have been slow but continuous decreases in the outflow rate, which hints that the recovery too will be slower than previous downturns. Indeed, the current crisis appears to be marked by a shift in inflow and outflow rates from their performance during non-crises times but also from that of previous crises. The pace at which workers move into, and out of, unemployment has changed – with potentially pervasive effects for workers and employers.

Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period. Though GDP is usually calculated on an annual basis, it can be calculated on a quarterly basis as well. GDP includes all private and public consumption, government outlays, investments, private inventories, paid-in construction costs and the foreign balance of trade (exports are added, imports are subtracted). Put simply, GDP is a broad measurement of a nation’s overall economic activity – the godfather of the indicator world.

The unemployment rate is the share of the labor force that is jobless, expressed as a percentage. It is a lagging indicator, meaning that it generally rises or falls in the wake of changing economic conditions, rather than anticipating them. When the economy is in poor shape and jobs are scarce, the unemployment rate can be expected to rise. When the economy is growing at a healthy rate and jobs are relatively plentiful, it can be expected to fall.

III - Data & Research methodology

For the research we used some important variables in order to get to the conclusions, for that we used real GDP as a dependent variable for a specific period of time (2005-2016) the same with the unemployment rate and also the median equivalised net income.

The main statistical methods used for reaching the proposed objectives are: principal component analysis and econometric modelling.

The identification of regional disparities is conducted by applying the methods of multivariate statistical analysis, the analysis of principal components. This descriptive method of multidimensional data analysis has the role to highlight the correlations among variables and the resemblances, respectively the differences among statistical units (Escofier, B., Pages, J., 1998). The advantage of this method is the synthetic graphical representation in a system of factorial axes of statistical units and statistical variables.

The factorial axes are linear combinations of statistical variables. To each factorial axis a part of the information contained in the initial data table is associated, also named explained variance (Bénzecri, 1992). The factorial axes are classified in a decreasing order according to their discriminatory power: the first factorial axis explains most of the total variance, highlighting thus the greatest differences among the statistical units. The interpretation of results will be conducted, thus, for a reduced number of factorial axes (Everitt, Dunn, 2001). For measuring the differences between EU countries for GDP, we estimate ANOVA models.

The general form of ANOVA model with one dummy variable is:

$Y = \alpha_0 + \alpha_1 \cdot D + \varepsilon$ where D is the dummy variable: D=1 or D=0

α_0 is the average level of variable Y for D=0 category

$\alpha_0 + \alpha_1$ shows the average level of variable Y for D=1 category

α_1 shows the difference between the average level of variable Y for category 1 and the average level of variable Y for category 0 .

The model with two dummy variables has the general form:

$$Y = \alpha_0 + \alpha_1 D_1 + + \alpha_2 D_2 + \varepsilon ,$$

where:

Y is the dependent variable

D_1 and D_2 are two dummy variables defined according to the economic development level registered in EU countries, appreciated by means of the registration of main macroeconomic indicators. The values of the dummy variables are assigned according to the division of the EU countries in 3 groups: group 1 (countries which entered after 2007: Bulgaria, Croatia, Romania), group 2 (countries which entered in 2004: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia) and group 3 (countries from West Europe: Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Netherlands, Austria, Portugal, Finland, Sweden, United Kingdom, Luxembourg).

For the countries from group 1 we consider $D_1=1$ and we for the countries from group 2 we consider $D_2=1$.

The countries having null values for the variables D_1 and D_2 are those from the 3rd group.

The parameters of the model are:

- α_0 shows the level of Y variable for group 3 (D_1=0, D_2=0).
- $\alpha_0+\alpha_1$ shows the level of variable Y for group 1 (D_1=1, D_2=0).
- α_1 hows the difference between the average level of variable Y for group 1 and 3.
- $\alpha_0+\alpha_2$ shows the average level of variable Y for group 2 (D1=0, D2=1).
- α_2 shows the difference between the average level of variable Y for group 2 and 3.

The coefficients α_i represent the coefficients of econometric equations. Their estimation is made by means of the OLS method.

IV - Empirical Study

In the Empirical Study, in the first part we analyzed the descriptive statistic for our indicators (GDP, unemployment rate and median income). For the second part we estimate the econometric models.

1. Descriptive analysis of GDP/capita in 2016

We wanted to start by analyzing a very important indicator, GDP/capita (euro) in year 2016. From the data we observe that there are slight differences between the values, the GDP is in euro.

Following data processing, the following results were obtained:

Descriptives

			Statistic
GDP_cap	Mean		25921.4286
	95% Confidence Interval for Mean	Lower Bound	19191.8396
		Upper Bound	32651.0176
	5% Trimmed Mean		24238.8889
	Median		19700.0000
	Variance		301198042.3
	Std. Deviation		17355.05812
	Minimum		5900.00
	Maximum		87600.00
	Range		81700.00
	Interquartile Range		24425.00
	Skewness		1.709
	Kurtosis		4.543

Source:*own processing in SPSS

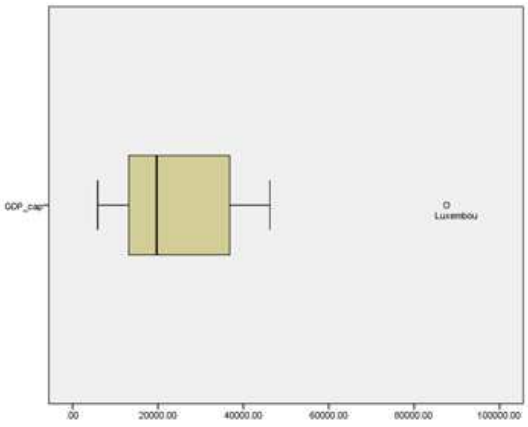


Figure 1: Descriptive statistics for GDP (in euro)

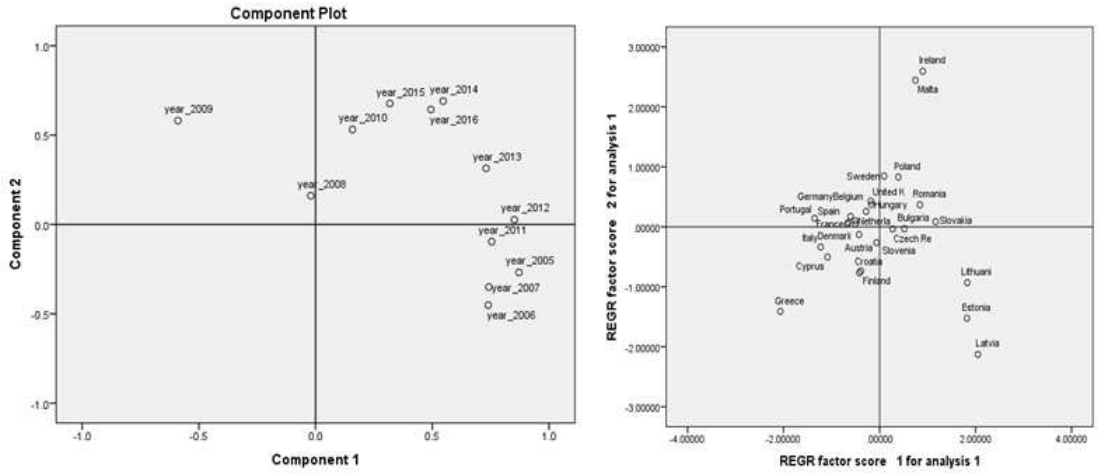
We can observe the fact that in year 2016 the average level of the GDP/capita was 25921 euro but with a very high variation of 17355 euro. These results and the diagram box plot represented above show the fact that Luxembourg is an outlier so from this point on it will be eliminated from our following analysis.

2. Analysis of the evolution of the main macroeconomic indicators

2.1 Analyzing the dynamics of GDP growth rate in the period 2005 – 2016

For analyzing the real growth rate we will apply the principal component analysis. We first tested the hypothesis of independence between variables. As shown in the table which can be found in Annex 1 we observe that the variables are dependent.

According to Bénzecri's criterion, we observe that 3 factorial axes account together for 73,702% of the total variation. For the first axis we have year 2009 as a negative value and two periods of time that are positive 2005-2007 and 2011-2014. For the second axis we have only positive values for the years 2009-2016 and for the third axis, 2015 is a negative value while 2010-2011 are positive. From this we can observe that year 2009 it's a very important year for this research because that's the year that shows the immediate repercussions of economic crisis.



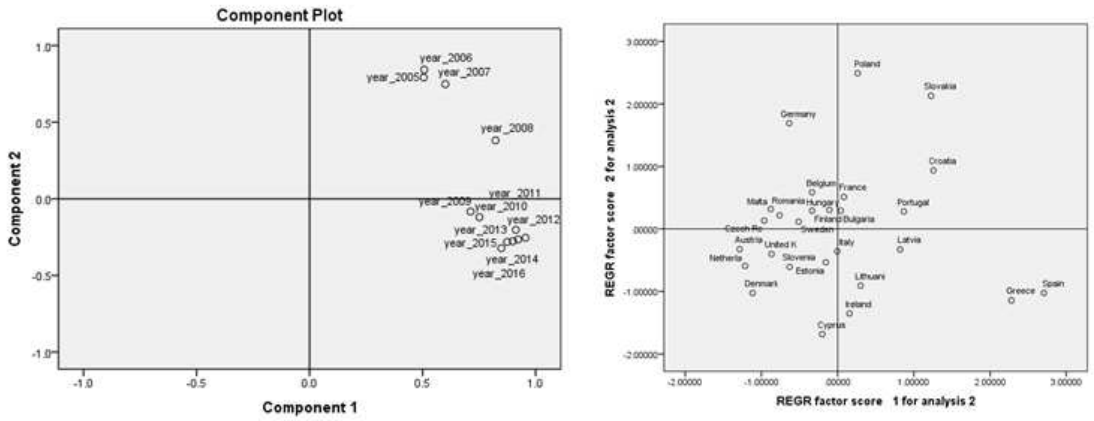
Source: *own processing in SPSS

Figure 2: Representation of GDP in EU countries in the first two factorial component in the period 2005 – 2016

From the graphs we can observe that GDP was negative in year 2009, really low during 2005-2007 and starting to rise with 2010.

2.2 Analyzing the dynamics of the unemployment rate in the period 2005 - 2016

A relevant part of the analysis is to question the indicators that we choose. Even if for us all of them are important, we agreed that the unemployment is the one that makes the difference. It is in our conception the one that better rates an economic situation. A country may be rich as it has a high Gross Domestic Product or may have a low inflation, but the most relevant is the fact that the population has a place where to work, which brings them the possibility to buy things and manage in this way to live. The unemployment rate is in percentages.



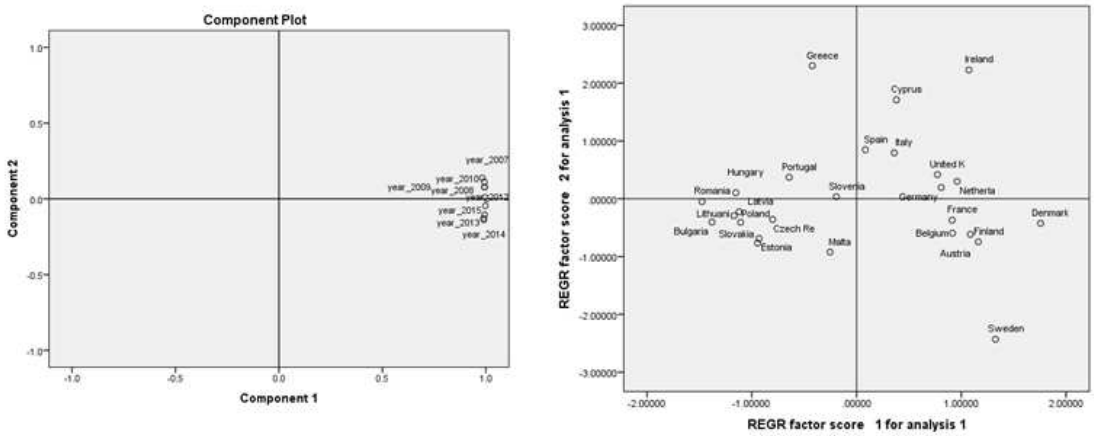
Source: *own processing in SPSS

Figure 3: Representation of Unemployment rate in EU countries in the first two factorial component in the period 2005 - 2016

From the Figure 3 we can observe that the unemplomet rate was higher during the years 2005-2008 which are the years prior to the economic crisis and started to fall with the beginning of 2010.

2.3 Analyzing the dynamics of income during 2007 - 2015

For analyzing the dynamics of income (euro) during 2007 - 2015 we used median income due to previously identified economic disparities. We exclude Croatia because the data was missing. As we can observe there are high differences in income between the EU countries represented in the figure below. The countries from Central and East Europe (Romania, Bulgaria, Hungary, Lithuania, Poland, Slovakia) have lower values for income than the countries in West Europe during the period 2007 - 2015. The countries positioning is related with the year of accession in EU.



Source: *own processing in SPSS

Figure 4: Representation of median income in EU countries in the first two factorial component in the period 2007 – 2015

3. Estimation of the differences between EU countries in terms of GDP in 2016 compared to 2009

At this section I used an ANOVA model with only one dummy variable and with this I want to state the differences between countries in year 2016 in comparison with 2009.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-5.559	.561		-9.907	.000
	D1	7.937	.794	.811	10.001	.000

a. Dependent Variable: gdp

Source: *own processing in SPSS

The estimated model equation is GDP= -5,559 + 7,937D.

Where year 2016 is 0 for D and year 2009 is 1 for D. The obtained result show that:

in 2009 the average variation rate of GDP is -5,559% and in 2016 the average variation rate of GDP is -5,559 + 7,937 = 2,378%.

α_1 = 7,937 - this is the difference between the average level of the variation of income from 2016 than in 2009. This means that 2016 GDP rate it was in average with 7,937% more than in 2009.

The small difference between them implies the fact that the EU countries had a big deficit in 2009 but they were able by 2016 to reduce and come back on their feet. The full results of the modellation are in Annex 3.

4. Estimation of GDP differences between the groups of EU countries

After analyzing all the indicators and how they influence economic shifts in time I reached the idea that the year of accession has an important place in how the countries managed the economic crisis and how they got out of it. We made 3 groupings of the EU countries and the values for the two dummy variables, these are:

Table 1: The definition of the dummy variables

Group	D_1	D_2
Group 1 (Bulgaria, Croatia, Romania)	1	0
Group 2 (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia)	0	1
Group 3 (Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Netherlands, Austria, Portugal, Finland, Sweden, United Kingdom)	0	0

Source: *own processing in SPSS

4.1 Estimation of GDP differences between the groups of EU countries in 2009

The results of the estimation are as follows:

Table 2: Estimate coefficients of ANOVA model with two dummy variables

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.436	1.039		-4.270	.000
	D1	-1.598	2.473	-.130	-.646	.524
	D2	-2.554	1.609	-.320	-1.587	.126

a. Dependent Variable: gdp

Source: *own processing in SPSS

In 2009 from the Table 2 showed above we can observe the fact that there are big differences between the data during this year. This happened because 2009 it's the year when the economic crisis was felt in all over the world especially in EU.

Our example is $Y_x = -4{,}436 - 1{,}598D_1 - 2{,}554D_2$

α_0 -4,436 →this shows that the average level of GDP growth rate for the countries in West Europe for the year 2009 was -4,436%;

$\alpha_0 + \alpha_1$,436 - 1,598 = -6,034 → this shows that the average level of GDP growth rate for the countries which access EU after 2007;

α_1 = -1,598 → this shows the difference between the average level of GDP for the countries which access EU after 2007 and the countries from West Europe for year 2009 which was -1,598%;

$\alpha_0 + \alpha_2$ = - 4,436 - 2,554 = - 6,99 → shows the average level of GDP growth rate for the countries which access EU in 2004 for the year 2009 which was -6,99%;

α_2 = -2,554 → shows the difference between the average level of GDP for the countries which access EU in 2004 and the West European countries for year 2009;

4.2 Estimation of GDP differences between the groups of EU countries in 2016

In 2016 from the Table 2 showed below we can observe the fact that there are no big differences between the data during this year. This is a very interesting outcome because by 2016 the countries started to cover the deficit accumulated and GDP started to rise which means that EU countries are starting to leave behind the tracks of economic crisis.

Our example is $Y_x = 1{,}893 + 1{,}807D_1 + 0{,}767D_2$

α_0 = 1,893 →this shows that the average level of GDP growth rate for the countries in West Europe for the year 2016 was 1,893%;

$\alpha_0 + \alpha_1$ = 1,893 + 1,807 = 3,7 → this shows that the average level of GDP growth rate for the countries which access EU after 2007 for the year 2016 was 3,7%;

a_1 = 1,807 → this shows the difference between the average level of GDP for the countries which access EU after 2007 and the countries from West Europe for year 2016 was 1,807 %;

$\alpha_0 + \alpha_2$ = 1,893 + 0,767 = 2,66 → this shows the average level of GDP growth rate for the countries which access EU in 2004 for the year 2016 was 2,66%;

α_2 = 0,767 → this shows the difference between the average level of GDP for the countries which access EU in 2004 and the West European countries for year 2016 was 0,767%;

Table 3: Estimate coefficients of ANOVA model with two dummy variables

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.893	.305		6.200	.000
	D1	1.807	.727	.463	2.487	.020
	D2	.767	.473	.302	1.622	.118

a. Dependent Variable: gdp

Source: *own processing in SPSS

As an interpretation of the data, in year 2009 the differences are big because of the economic crisis and the different responses of the countries, but the interesting facts happen in 2016 when the differences are not so big, but here an fascinating aspect intervenes and that is that the countries which access EU after 2007 had in 2009 a low GDP so it made a gap between the West European countries but during the economic crisis the countries from West Europe had small fluctuances in GDP and remain almost constant. By the time 2016 arrived the countries which accessed EU after 2007 have recovered and exceed the GDP from the countries in West Europe.

5. Estimation of the differences between unemployment rate from 2016 and 2009

For this part we used also an ANOVA model with only one dummy variable and with this I want to state the differences in the unemployment rate between countries in year 2016 in comparison with 2009.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.763	.777		11.283	.000
	D1	.304	1.098	.038	.277	.783

a. Dependent Variable: unemploy

Source: *own processing in SPSS

The estimated model equation is GDP= 8,763 + 0,304D.

Where year 2016 is 1 for D and year 2009 is 0 for D.

After the result we observe that there are no significant differences between average unemployment rate from year 2016 than in 2009. EU countries are still facing high unemployment rate, comparable to those in the first year of the current economic crisis.

6. Estimation of unemployment rate differences between the groups of EU countries

6.1 Estimation of unemployment rate differences between the groups of EU countries in 2009

Our example is $Y_x = 8{,}736 - 1{,}202D_1 - 1{,}254D_2$

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.736	.939		9.300	.000
	D1	-1.202	2.236	-.111	-.538	.596
	D2	1.254	1.455	.178	.862	.397

a. Dependent Variable: unemploy

Source: *own processing in SPSS

There are no significant differences between the average GDP rate from 2016 than in 2009. EU countries are still confronting high average GDP rates in comparison with the ones from the first year of economic crisis.

6.2 Estimation of unemployment rate differences between the groups of EU countries in 2016

Our example is $Y_x = 9{,}621 - 0{,}688D_1 - 2{,}111D_2$

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.621	1.229		7.832	.000
	D1	-.688	2.925	-.049	-.235	.816
	D2	-2.111	1.903	-.229	-1.109	.278

a. Dependent Variable: unemploy

Source: *own processing in SPSS

There are no significant differences between the average unemployment rate for the three groups of countries in both 2016 and 2009. All EU countries, regardless of the group they are part of, register unemployment rates with similar levels in 2016 with those of 2009.

V – Conclusion

In the paper I sought to identify the differences in the EU countries from the point of view of the most important macroeconomic indicators namely GDP, unemployment rate, median income. Also we proposed to analyze the implications that the economic crisis which emerged in 2008 had over the labour market in the EU countries.

Following the empirical study, we observed that year 2009 was the year in which have been registered the highest cut of GDP rate, in almost every EU country. The EU countries' income analysis has highlighted the fact that Central and Eastern European countries have recorded lower incomes over the whole period (2007 - 2015) than the Western European countries.

This results show the achievement of the last part of the empirical study in which we grouped the EU countries according to the moment of accession like the following: group of West countries, group of Central and East countries which accessed in 2004 and the group of East Europe which accessed after year 2007. By using the ANOVA econometric models with one or two dummy variables we estimate the differences between the GDP rate registered in 2016 compared with the first year that the economic crisis emerged in these countries. The obtained results highlight the fact that the GDP rate from 2016 differs from a statistical point of view with a significant level of 1% than in 2009.

The obtained estimations after the econometric modeling with two dummy variables show the fact that in year 2009 there were no significant differences in the variation of GDP rate between the three groups of EU countries. In year 2016 this differences are still significant statistically for Romania, Bulgaria and Croatia than the West Europe countries. First three countries faced in 2016 a higher GDP rate than in the Western European countries.

Central and East Europe countries faced in the last decade very high GDP variation. The authorities in these countries must adapt a growth strategy which assures a sustainable development on a long term.

ANNEX

Annex 1: Results of GDP analysis for the period 2005 - 2016 (*own processing in SPSS)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.627
Bartlett's Test of Sphericity	Approx. Chi-Square	262.114
	df	66
	Sig.	.000

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.700	39.169	39.169	4.700	39.169	39.169
2	2.501	20.844	60.014	2.501	20.844	60.014
3	1.643	13.689	73.702			
4	1.471	12.260	85.963			
5	.703	5.862	91.825			
6	.306	2.553	94.377			
7	.244	2.033	96.410			
8	.130	1.086	97.497			
9	.121	1.007	98.503			
10	.081	.675	99.178			
11	.065	.538	99.716			
12	.034	.284	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
year_2005	.871	-.269	-.247
year_2006	.739	-.452	-.345
year_2007	.742	-.350	-.124
year_2008	-.021	.161	.068
year_2009	-.589	.581	.094
year_2010	.158	.531	.671
year_2011	.755	-.096	.566
year_2012	.851	.027	.442
year_2013	.730	.314	.218
year_2014	.546	.690	-.226
year_2015	.318	.677	-.509
year_2016	.494	.643	-.332

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Annex 2: The results of Principal component analysis concerning unemployment rate (*own processing in SPSS)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.691
Bartlett's Test of Sphericity	Approx. Chi-Square	832.325
	df	66
	Sig.	.000

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.513	62.607	62.607	7.513	62.607	62.607
2	2.499	20.828	83.436	2.499	20.828	83.436
3	1.501	12.505	95.941			
4	.332	2.769	98.710			
5	.106	.886	99.596			
6	.022	.187	99.783			
7	.009	.079	99.862			
8	.007	.059	99.921			
9	.005	.039	99.960			
10	.004	.031	99.991			
11	.001	.005	99.995			
12	.001	.005	100.000			

Extraction Method: Principal Component Analysis.

Annex 2.3 Analyzing the dynamics of income during 2007 - 2015 (*own processing in SPSS)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.845
Bartlett's Test of Sphericity	Approx. Chi-Square	951.341
	df	36
	Sig.	.000

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	850.454	1	850.454	100.028	.000[b]
	Residual	442.112	52	8.502		
	Total	1292.565	53			

a. Dependent Variable: gdp

b. Predictors: (Constant), D1

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.858	98.424	98.424	8.858	98.424	98.424
2	.093	1.030	99.455	.093	1.030	99.455
3	.033	.367	99.822			
4	.010	.109	99.931			
5	.004	.048	99.979			
6	.001	.010	99.989			
7	.001	.006	99.995			
8	.000	.003	99.998			
9	.000	.002	100.000			

Extraction Method: Principal Component Analysis.

Annex 3 Estimation of the differences between EU countries in terms of GDP in 2016 compared to 2009 (*own processing in SPSS)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.811[a]	.658	.651	2.91584

a. Predictors: (Constant), D1

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